CLAIMS:

1. A novel microorganism *A. ureafaciens* K2032, which shows an activity of selectively producing difructose dianhydride IV from levan and an activity of degrading levan.

2. A novel levan fructotransferase of the following amino acid sequence 1, derived from *A. ureafaciens* K2032, which can hydrolyze levan to selectively produce difructose dianhydride IV:

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  1 M T P A I S R R A V L Q G A G A G A L A L I F G G A V P P A
 31 A R A S A P G S L R A V Y H M T P P S G W L C D P Q R P V T
 61 T H G A Y Q L Y Y L H S D Q N N G P G G W D H A S T T D G V
 91 A F T H H G T V M P L R P D F P V W S G S A V V G T A N T A
121 G F G A G A V V A L A T Q P T D G V R K Y Q E Q Y L Y W S T
151 D G G F T F T A L P D P V I V N T D G R A A T T P A E I E N
181 A E W F R D P K I H W D T A R G E W V C V I G R L R Y A A F
211 Y T S P N L R D W T L R R N F D Y P N H A L G G I E C P D L
241 F E I T A D D G T R H W V L A A S M D A Y G I G L P M T Y A
271 Y W T G T W D G E Q F H A D D L T P Q W L D W G W D W Y A A
301 V T W P S I D A P E T K R L A I A W M N N W K Y A A R D V P
331 T D A S D G Y N G Q N S I V R E L R L A R Q P G G W Y T L L
361 S T P V A A L T N Y V T A T T T L P D R T V D G S A V L P W
391 N G R A Y E I E L D I A W D T A T N V G I S V G R S P D G T
421 R H T N I G K Y G A D L Y V D R G P S D L A G Y S L A P Y S
451 R A A A P I D P G A R S V H L R I L V D T Q S V E V F V N A
481 G H T V L S Q Q V H F A E G D T G I S L Y T D G G P A H F T
511 G I V V R E I G Q A I *
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3. A novel levan fructotransferase gene, which has a base sequence coding for the amino acid sequence of claim 2.

4. A novel levan fructotransferase gene as set forth in claim 3, wherein the base sequence is the following sequence 2:

1 GCGGTGCACCCCGACTTCCCCTCGACGACCACCGTCCCCCTACCGGCCGACCGCCCGGCCCGACTGCTCCTCAGCCTAGACGGGCCCCTC

91 CTCGAGGTCTTCGTCGGGGACGGTGAGGCGACTGCGTCGAACCTGGTCCTCCTGGGGGCCGGCGGTGTGACCGCGAGCCTCGAGACGGCA

181 CGGCCAGGAACCGTGCACGTGACCGCGATCGACGTCGAGGCGCCCAGCGATGCTGACGCCCCTGAACCTGCCGCCGTTCTGGGCTGACGA

271 GCGCTCCCACCCCGACAGCTCTCCTTCTACCGCTGCCCGAACCAGGGTGGACGCTTCGTCGCGCCCACCCGTCCACGAGAGGAACCAGCA

361 ATGACGCCGGCCATCTCACGCCGCGCCGTGCTCCAGGGAGCCGGCGCCGGAGCACTCGCCCTGATCTTCGGCGGTGCTGTGCCGCCTGCA

451 GCCCGGGCATCCGCTCCGGGCTCGCTCCGTGCCGTCTACCACATGACGCCCCCCAGCGGCTGGCTCTGCGACCCCCAACGCCCGGTCACC

541 ACCCACGGCGCCTACCAGCTGTACTACCTGCACTCCGACCAGAACAACGGCCCCGGCGGCTGGGACCACGCGAGCACGACCGACGGCGTC

631 GCCTTCACGCACCACGGCACCGTGATGCCGCTGCGGCCCGACTTCCCCGTGTGGTCCGGGTCGGCGGTCGTCGGCACCGCGAACACGGCA

721 GGGTTCGGCGCCGGCGCGGTCGTCGCGCTCGCGACCCAGCCGACCGACGGCGTCCGCAAGTACCAGGAGCAGTACCTCTACTGGTCGACC

811 GACGGCGGGTTCACGTTCACCGCCCTGCCCGACCCCGTCATCGTCAACACCGACGGTCGCGCCGCCACCACGCCCGCCGAGATCGAGAAC

901 GCCGAGTGGTTCCGCGACCCCAAGATCCACTGGGACACCGCCCGCGGAGAATGGGTCTGCGTCATCGGACGACTGCGGTACGCCGCGTTC

991 TACACCTCGCCGAACCTGCGCGACTGGACACTTCGCCGCAACTTCGACTACCCGAACCACGCCCTCGGCGGCATCGAGTGCCCCGACCTG

1081 TTCGAGATCACCGCAGACGACGGGACACGCCACTGGGTGCTCGCCGCCAGCATGGACGCCTACGGCATCGGCCTCCCCATGACGTACGCC

1171 TACTGGACAGGCACCTGGGACGGCGAGCAGTTCCACGCCGACGACCTCACCCCGCAATGGCTCGACTGGGGCTGGGACTGGTACGCGGCC

1261 GTCACCTGGCCATCGATCGACGCGCCCGAGACCAAGCGCCTCGCCATCGCGTGGATGAACAACTGGAAGTACGCCGCACGCGACGTCCCC

1351 ACCGACGCATCCGACGGCTACAACGGGCAGAACTCGATCGTCCGCGAGCTGCGGCTCGCCCGACAGCCTGGCGGCTGGTACACCCTCCTG

1441 AGCACCCCCGTGGCAGCGCTGACGAACTACGTCACCGCCACCACCACACTCCCCGACCGGACCGTCGACGGCAGCGCCGTCCTGCCATGG

1531 AACGGACGCGCATACGAGATCGAGCTCGACATCGCCTGGGACACCGCGACGAACGTCGGCATCTCGGTGGGCCGCTCCCCCGACGGAACC

1621 CGGCACACGAACATCGGCAAGTACGGAGCAGACCTGTACGTCGACCGAGGACCCTCCGACCTCGCCGGGTACTCGCTCGCCCCCTACTCG

1711 CGAGCCGCCGCCCCCATCGACCCCGGCGCCCGATCCGTGCACCTGCGCATCCTCGTCGACACCCAGAGCGTCGAGGTCTTCGTCAACGCC

1801 GGCCACACCGTGCTCTCCCAGCAGGTCCACTTCGCCGAGGGCGACACGGGAATCTCGCTCTACACCGACGGCGGCCCCGCACACTTCACC

1891 GGCATCGTCGTCCGCGAGATTGGCCAGGCGATCTAGGCGATGCACACCACACCGCTCACCGAAGCCGCGCCCCGGGAGACGACGGCCGAC

1981 AATCGACACGTCCTCGTCGTT

5. A novel levan fructotransferase gene as set forth in claim 3, wherein the base sequence is the following sequence 3:

1 GCGGTGCACCCCGACTTCCCCTCGACGACCACCGTCCCCCTACCGGCCGACCGCCCGGCCCGACTGCTCCTCAGCCTAGACGGGCCCCTC

AvaI AvaI

91 CTCGAGGTCTTCGTCGGGGACGGTGAGGCGACTGCGTCGAACCTGGTCCTCCTGGGGGCCGGCGGTGTGACCGCGAGCCTCGAGACGGCA

181 CGGCCAGGAACCGTGCACGTGACCGCGATCGACGTCGAGGCGCCCAGCGATGCTGACGCCCCTGAACCTGCCGCCGTTCTGGGCTGACGA

271 GCGCTCCCACCCCGACAGCTCTCCTTCTACCGCTGCCCGAACCAGGGTGGACGCTTCGTCGCGCCCACCCGTCCACGAGAGGAACCAGCA

PstI

361 ATGACGCCGGCCATCTCACGCCGCGCCGTGCTCCAGGGAGCCGGCGCCGGAGCACTCGCCCTGATCTTCGGCGGTGCTGTGCCGCCTGCA

1 M T P A I S R R A V L Q G A G A G A L A L I F G G A V P P A

451 GCCCGGGCATCCGCTCCGGGCTCGCTCCGTGCCGTCTACCACATGACGCCCCCCAGCGGCTGGCTCTGCGACCCCCAACGCCCGGTCACC

31 A R A S A P G S L R A V Y H M T P P S G W L C D P Q R P V T

541 ACCCACGGCGCCTACCAGCTGTACTACCTGCACTCCGACCAGAACAACGGCCCCGGCGGCTGGGACCACGCGAGCACGACCGACGGCGTC

61 T H G A Y Q L Y Y L H S D Q N N G P G G W D H A S T T D G V

631 GCCTTCACGCACCACGGCACCGTGATGCCGCTGCGGCCCGACTTCCCCGTGTGGTCCGGGTCGGCGGTCGTCGGCACCGCGAACACGGCA

91 A F T H H G T V M P L R P D F P V W S G S A V V G T A N T A

721 GGGTTCGGCGCCGGCGCGGTCGTCGCGCTCGCGACCCAGCCGACCGACGGCGTCCGCAAGTACCAGGAGCAGTACCTCTACTGGTCGACC

121 G F G A G A V V A L A T Q P T D G V R K Y Q E Q Y L Y W S T

811 GACGGCGGGTTCACGTTCACCGCCCTGCCCGACCCCGTCATCGTCAACACCGACGGTCGCGCCGCCACCACGCCCGCCGAGATCGAGAAC

151 D G G F T F T A L P D P V I V N T D G R A A T T P A E I E N

901 GCCGAGTGGTTCCGCGACCCCAAGATCCACTGGGACACCGCCCGCGGAGAATGGGTCTGCGTCATCGGACGACTGCGGTACGCCGCGTTC

181 A E W F R D P K I H W D T A R G E W V C V I G R L R Y A A F

991 TACACCTCGCCGAACCTGCGCGACTGGACACTTCGCCGCAACTTCGACTACCCGAACCACGCCCTCGGCGGCATCGAGTGCCCCGACCTG

211 Y T S P N L R D W T L R R N F D Y P N H A L G G I E C P D L

1081 TTCGAGATCACCGCAGACGACGGGACACGCCACTGGGTGCTCGCCGCCAGCATGGACGCCTACGGCATCGGCCTCCCCATGACGTACGCC

241 F E I T A D D G T R H W V L A A S M D A Y G I G L P M T Y A

1171 TACTGGACAGGCACCTGGGACGGCGAGCAGTTCCACGCCGACGACCTCACCCCGCAATGGCTCGACTGGGGCTGGGACTGGTACGCGGCC

271 Y W T G T W D G E Q F H A D D L T P Q W L D W G W D W Y A A

ClaI AvaI

1261 GTCACCTGGCCATCGATCGACGCGCCCGAGACCAAGCGCCTCGCCATCGCGTGGATGAACAACTGGAAGTACGCCGCACGCGACGTCCCC

301 V T W P S I D A P E T K R L A I A W M N N W K Y A A R D V P

1351 ACCGACGCATCCGACGGCTACAACGGGCAGAACTCGATCGTCCGCGAGCTGCGGCTCGCCCGACAGCCTGGCGGCTGGTACACCCTCCTG

331 T D A S D G Y N G Q N S I V R E L R L A R Q P G G W Y T L L

NcoI

1441 AGCACCCCCGTGGCAGCGCTGACGAACTACGTCACCGCCACCACCACACTCCCCGACCGGACCGTCGACGGCAGCGCCGTCCTGCCATGG

361 S T P V A A L T N Y V T A T T T L P D R T V D G S A V L P W

1531 AACGGACGCGCATACGAGATCGAGCTCGACATCGCCTGGGACACCGCGACGAACGTCGGCATCTCGGTGGGCCGCTCCCCCGACGGAACC

391 N G R A Y E I E L D I A W D T A T N V G I S V G R S P D G T

1621 CGGCACACGAACATCGGCAAGTACGGAGCAGACCTGTACGTCGACCGAGGACCCTCCGACCTCGCCGGGTACTCGCTCGCCCCCTACTCG

421 R H T N I G K Y G A D L Y V D R G P S D L A G Y S L A P Y S

1711 CGAGCCGCCGCCCCCATCGACCCCGGCGCCCGATCCGTGCACCTGCGCATCCTCGTCGACACCCAGAGCGTCGAGGTCTTCGTCAACGCC

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451  R A A A P I D P G A R S V H L R I L V D T Q S V E V F V N A
1801 GGCCACACCGTGCTCTCCCAGCAGGTCCACTTCGCCGAGGGCGACACGGGAATCTCGCTCTACACCGACGGCGGCCCCGCACACTTCACC
481  G H T V L S Q Q V H F A E G D T G I S L Y T D G G P A H F T
                                                    SmaI
1891 GGCATCGTCGTCCGCGAGATTGGCCAGGCGATCTAGGCGATGCACACCACACCGCTCACCGAAGCCGCGCCCCGGGAGACGACGGCCGAC
511  G I V V R E I G Q A I *
1981 AATCGACACGTCCTCGTCGTT
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6. A recombinant expression vector, carrying the levan fructotransferase gene of claim 3.

7. A recombinant expression vector as set forth in claim 6, wherein said expression vector is pUDFA81.

8. A novel transformant transformed with a recombinant expression vector as set forth in claim 6.

9. A novel organism *E. coli* JUD81 (KCTC 0877BP), which is prepared by transforming *E. coli* DH5α with the expression vector pUDFA81 of claim 7.

10. A process for producing difructose dianhydride IV from levan, in which a levan solution is subjected to reaction at 25-50°C for 3-10 hours in an acidic buffer of pH 3.0-7.0 in the presence of a levan fructotransferase.

11. The process as set forth in claim 10, wherein the reaction is carried out at 37°C.

12. The process as set forth in claim ~~10, wherein~~ the acidic buffer is a

phosphate buffer of pH 5.8

13. The process as set forth in claim 10, wherein the levan solution has a levan concentration of 5-15 % (w/v).

14. The process as set forth in claim 10, wherein the levan fructotransferase has histidine residues at its C- or N-terminus.

15. A process of preparing levan fructotransferase, comprising the steps of:

culturing a bacterial species anchoring a levan fructotransferase gene-carrying, expression plasmid;

harvesting and homogenizing the cells; and

isolating levan fructotransferase from the cell homogenate.

16. The process as set forth in claim 15, wherein the levan fructotransferase has histidine residues at its N- or C-terminus.

17. The process as set forth in claim 15, wherein the isolating step is carried out using metal ion-affinity chromatography.

18. A process for producing difructose dianhydride IV from sucrose, comprising the steps of:

reacting a sugar solution at room temperature or lower in an acidic buffer of pH 3.0-7.0 in the presence of a levansucrase to produce levan;

purifying the levan from the sugar reaction mixture, partially or completely;

reacting a levan solution at 25-50°C for 3-10 hours in an acidic buffer of pH 3.0-7.0 in the presence of a levan fructotransferase to produce difructose dianhydride IV; and

isolating the difructose dianhydride IV from the levan reaction mixture.

19. The process as set forth in claim 18, wherein the levansucrase is derived from *Z. mobilis*.

20. The process as set forth in claim 18, wherein the sugar solution is reacted at 0-15°C.

21. The process as set forth in claim 18, wherein the sugar solution has a sugar concentration of 10-30 % (w/v).

22. The process as set forth in claim 18, wherein the levan solution is reacted at 37°C.

23. The process as set forth in claim 18, wherein the acidic buffer for the sugar solution is an acetic acid buffer of pH 5.0 and the acidic buffer for the levan solution is a phosphate buffer of pH 5.8

24. The process as set forth in claim 18, wherein the levan solution has a levan concentration of 5-15 % (w/v).